

# Now you need ... OK. GPS system



SmartGPS module connected to dsPICPRO4 Development System

By Dusan Mihajlovic  
MikroElektronika-Hardware Department

The Global Positioning System (GPS) is one of the leading technologies today used for navigation purposes. It is widely used in automotive navigation system. Connection between a GPS receiver and the microcontroller as well as determination of latitude and longitude will be described here.

The Global Positioning System (GPS) is based on a large number of satellites radiating microwave signals for picking up by GPS receivers to determine their current location, time or velocity. GPS receivers can communicate with a microcontroller or a PC in different ways. A common path is via the serial port, while the most commonly used protocol for transmitting data is called NMEA.

### Principle of operation

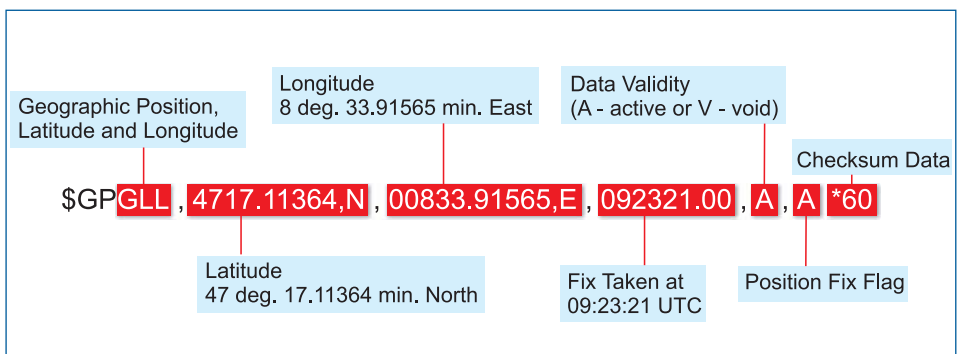
The NMEA protocol is based on strings. Every string starts with the \$ sign (ASCII 36) and terminates with a sequence of signs starting a new line such as CR (ASCII 13) and LF (ASCII 10). The meaning of the whole string depends on the first word. For example, a string starting with \$GPGLL gives information about latitude and longitude, exact time (Universal Coordinated Time), data validity (A – Active or V - Void) and checksum enabling you to check whether data is regularly received. Individual data items are separated by a comma ', '. Each second a set of NMEA strings is sent to the microcontroller. In the event that

data on latitude and longitude are not fixed (i.e. if a GPS receiver fails to determine its location) or when other data is not determined, the GPS receiver will keep outputting the same set of strings, leaving out any missing data.

Here is a string generated by the GPS receiver which failed to determine its location:

```
$GPGLL,,,,,V,N*64
```

An example of a complete NMEA string is shown below:



### Hardware

Connection between the microcontroller and GPS receiver is very simple. It is necessary to provide only two lines RX and TX for this purpose. Refer to the Schematic 1. The RX line is used for sending data from a GPS receiver to the microcontroller, while the TX line can be used for sending specific commands from the microcontroller to the GPS receiver. The U-Blox LEA-5S GPS receiver is used in this project. Similar to most GPS receivers, the power supply voltage of this receiver is 3V.

